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Improving the Accuracy of **Data Race Detection** Robert H. B. Netzer [netzer@cs.wisc.edu](mailto:netzer@cs.wisc.edu)  
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time and space complexity of on-the-fly **data race detection**, requiring  $O(mp)$ space (where  $p$  is the  
[ftp.cpsc.ucalgary.ca/pub/users/stevef/Simulation/Reports1/cs93-15.ps.Z](http://ftp.cpsc.ucalgary.ca/pub/users/stevef/Simulation/Reports1/cs93-15.ps.Z)

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[www.cs.umd.edu/~keleher/papers/osdi96.ps.gz](http://www.cs.umd.edu/~keleher/papers/osdi96.ps.gz)

[Detecting Data Races in Cilk Programs that Use Locks - Guang-len Cheng \(1998\)](#) (Correct) (6 citations)  
a data race is usually a bug, automatic **data-race detection** has been studied extensively. Static race  
theory.[lcs.mit.edu/pub/cilk/brelly.ps.gz](http://lcs.mit.edu/pub/cilk/brelly.ps.gz)

[Shared Memory Consistency Conditions for Non-Sequential... - Attiya, al. \(1993\)](#) (Correct) (14 citations)  
and B. Miller. Improving the Accuracy of **Data Race Detection**. In Proc. of the 3rd ACM Symposium on  
[casaturn.kaist.ac.kr/~sikang/course/CS614/ACFW93.ps.gz](http://casaturn.kaist.ac.kr/~sikang/course/CS614/ACFW93.ps.gz)

[Synthesizing Dynamic Programming Algorithms from Linear... - Rosu, Havelund \(2001\)](#) (Correct) (1 citation)  
for Java. In earlier work, we implemented **data race detection** and deadlock detection algorithms for  
[ase.arc.nasa.gov/grosu/download/dtl.ps.gz](http://ase.arc.nasa.gov/grosu/download/dtl.ps.gz)

[Analysis of Multithreaded Programs - Rinard \(2001\)](#) (Correct) (1 citation)  
parallel threads. Sections 4 and 5 discuss **data race detection** for activity management programs and  
[www.cag.lcs.mit.edu/~rinard/paper/sas01.ps](http://www.cag.lcs.mit.edu/~rinard/paper/sas01.ps)

[Detecting Data Races in Parallel Program Executions - Netzer \(1989\)](#) (Correct) (15 citations)  
and then present a two-phase approach to **data race detection** that attempts to validate the accuracy of  
[grilled.cs.wisc.edu/technical\\_papers/detecting.ps.Z](http://grilled.cs.wisc.edu/technical_papers/detecting.ps.Z)

[HPFIT: A Set Of Integrated Tools For The... - Brandes.. \(1996\)](#) (Correct) (4 citations)  
and tools for automatic data distribution, **data-race detection**, static performance estimation, and  
[www.ens-lyon.fr/~desprez/FILES/RESEARCH/PAPERS/HPFIT/ws\\_part1.ps.gz](http://www.ens-lyon.fr/~desprez/FILES/RESEARCH/PAPERS/HPFIT/ws_part1.ps.gz)

[The D Editor: A New Interactive Parallel Programming Tool - Hiranandani, Kennedy.. \(1994\)](#) (Correct) (2 citations)  
performing automatic data decomposition [3]**data-race detection**, static performance estimation [4, 20]  
[softlib.rice.edu/pub/CRPC-TRs/reports/CRPC-TR94488.ps.gz](http://softlib.rice.edu/pub/CRPC-TRs/reports/CRPC-TR94488.ps.gz)

[Execution Replay and Debugging - Ronsse, De Bosschere, de Kergommeaux](#) (Correct) (4 citations)  
be used to debug the program: visualisation, **data race detection**, etc. is possible during replay without  
[www.bruegge.in.tum.de/projects/AADEBUG/proceedings/debosschere-invited.ps.gz](http://www.bruegge.in.tum.de/projects/AADEBUG/proceedings/debosschere-invited.ps.gz)

[FIAT: A Framework for Interprocedural Analysis and... - Carle, Hall.. \(1995\)](#) (Correct) (1 citation)  
tools, including completed systems for **data race detection** and static performance estimation, and  
[softlib.rice.edu/pub/CRPC-TRs/reports/CRPC-TR95522-S.ps.gz](http://softlib.rice.edu/pub/CRPC-TRs/reports/CRPC-TR95522-S.ps.gz)

[Algorithms for Data-Race Detection in Multithreaded Programs - Cheng \(1998\)](#) (Correct)

Algorithms for **Data-Race Detection** in Multithreaded Programs by Guang-len  
[www.lcs.mit.edu/publications/pubs/pdf/MIT-LCS-TR-758.pdf](http://www.lcs.mit.edu/publications/pubs/pdf/MIT-LCS-TR-758.pdf)

Non-intrusive on-the-fly data race detection using.. - Ronsse, De Bosschere (Correct)  
Non-Intrusive On-The- Y **Data Race Detection** Using Execution Replay. Michiel Ronsse  
[www.bruegge.in.tum.de/projects/AADEBUG/proceedings/20ronsse.ps.gz](http://www.bruegge.in.tum.de/projects/AADEBUG/proceedings/20ronsse.ps.gz)

Design and Implementation of the D Editor (Extended Abstract) - Hiranandani, al. (Correct)  
performing automatic data decomposition [2]**data-race detection**, static performance estimation [3, 13]  
[www.cs.umd.edu/projects/cosmic/papers/siam94.ps](http://www.cs.umd.edu/projects/cosmic/papers/siam94.ps)

Distributed Shared Memory: Bridging the Granularity Gap - Itzkovitz, Schuster (1999) (Correct)  
services, such as garbage collection and **data race detection**. Indeed, using MultiView results in a  
[www.cs.umd.edu/~keleher/wsdsm99/1999/schuster-granularity.pdf](http://www.cs.umd.edu/~keleher/wsdsm99/1999/schuster-granularity.pdf)

Towards Integration of Data Race Detection in DSM Systems - In (Correct)  
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[Using Runtime Analysis to Guide Model Checking of Java Programs - Havelund \(2000\)](#) (Correct) (4 citations)

runtime analysis algorithms, an existing data **race** detection algorithm and a new deadlock detection

**Race condition!** Variable **x** in class **Value** is

[ic.arc.nasa.gov/ic/publications/pdf/2000-0177.pdf](http://ic.arc.nasa.gov/ic/publications/pdf/2000-0177.pdf)

[Parallel Application Software on High Performance Computers.. - Allan, Müller \(1999\)](#) (Correct) (2 citations)

: 25 4.2 **Race** Conditions :

:22 3.5 Using **Condition Variables** :

[www.dl.ac.uk/TCSC/Subjects/Parallel\\_Algorithms/SMPreport/smp\\_doc.ps](http://www.dl.ac.uk/TCSC/Subjects/Parallel_Algorithms/SMPreport/smp_doc.ps)

[Thread-Safe Message Passing With P4 and MPI - Aswini Chowdappa \(1994\)](#) (Correct) (3 citations)

concurrently without leading to erroneous results, **race** conditions or deadlocks. Multiple threads

destroy)synchronization (mutual exclusion, **condition variable**, semaphores)and signal handling. An

[nscp01.physics.upenn.edu/parallel/environments/mpi/unify/reports/Message-Passing/p4-mpi-pthreads.ps.Z](http://nscp01.physics.upenn.edu/parallel/environments/mpi/unify/reports/Message-Passing/p4-mpi-pthreads.ps.Z)

[Advanced Thread Synchronization in Java - Heinlein](#) (Correct)

already high enough possibility of undesired **race** conditions evenfurther. Using the bounded buffer

complicated by the fact that monitors and **condition variables** -w hich have been related, but separate

[www.netobjectdays.org/node02/de/Conf/publish/../../../../pdf/02/papers/node/0361.pdf](http://www.netobjectdays.org/node02/de/Conf/publish/../../../../pdf/02/papers/node/0361.pdf)

[A Type System for Preventing Data Races and Deadlocks.. - Chandrasekhar..](#) (Correct)

A Type System for Preventing Data **Races** and Deadlocks in Java Programs Chandrasekhar

where clauses in [11, 24]Support for **Condition Variables**: In addition to mutual exclusion locks,

[www.lcs.mit.edu/publications/pubs/pdf/MIT-LCS-TR-839.pdf](http://www.lcs.mit.edu/publications/pubs/pdf/MIT-LCS-TR-839.pdf)

[Systematic Testing of Multithreaded Programs - Bruening, Chapin](#) (Correct)

Atoolcalled the Nondeterminator [FL97] detects data **races** in Cilk, a multithreaded variant of C. The

or using an if insteadofawhile to test a **condition variable**. The rest of the paper is organized as

[www.lcs.mit.edu/publications/pubs/pdf/MIT-LCS-TM-607.pdf](http://www.lcs.mit.edu/publications/pubs/pdf/MIT-LCS-TM-607.pdf)

[A Thread Visualization System - Michael Bedy And](#) (Correct)

to help students learn to avoid these risks (e.g.**race** conditions and deadlocks) This system uses an

classes. Additionally, Monitor provides a **Condition variable** class. These classes provide a more

[www.cs.mtu.edu/~shene/NSF-3/visual.ps.gz](http://www.cs.mtu.edu/~shene/NSF-3/visual.ps.gz)

[Leader/Followers - Design Pattern For](#) (Correct)

request into/from the message queue. ffl Prevent **race** conditions on handle sets: Multiple threads that

synchronizer, such as a mutex, semaphore, or **condition variable**. For instance, a pool of threads cannot

[www.cs.wustl.edu/~schmidt/lf.ps.gz](http://www.cs.wustl.edu/~schmidt/lf.ps.gz)

[A Portable Class Library for Teaching Multithreaded Programming - Steve Carr And](#) (Correct)

by a static analyzer for potential deadlocks and **race** conditions. At this stage, a student should have

class **Condition** that implements classic **condition variables**. Since Cclasses are not synchronized,

[www.cs.mtu.edu/~shene/NSF-3/..edu/fticse00.ps.gz](http://www.cs.mtu.edu/~shene/NSF-3/..edu/fticse00.ps.gz)

[A Model Checker for Statecharts \(Linking CASE tools with Formal.. - Day \(1993\)](#) (Correct)

:18 2.2.2 Multiple Actions on a Transition and **Race** Conditions :21

:46 5.4 **Variable Condition** (var Cond)

: 47 5.4.3 Evaluating the **Variable Condition** :

[ftp.cs.ubc.ca/ftp/local/techreports/1993/TR-93-35.ps.gz](http://ftp.cs.ubc.ca/ftp/local/techreports/1993/TR-93-35.ps.gz)

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